## REMARKS

Claims 1, 8, 11, 12, 17, 26, 38, 44, 49, 59, 60, 69, 72, 73, 76, 77, 78, and 79 were previously pending in this application with claims 59, 60, 69, 76, and 79 being withdrawn. Claim 8 has been amended herein and claim 80 is newly presented. Claim 8 has been amended to correct an error introduced in Applicant's prior Amendment filed June 29, 2010 in which the words "according to" were omitted from the preamble of this claim. Support for the subject matter of claim 80 is provided, for example at paragraphs [0007] and [0016] of Applicant's published application (US 2006/0165174). As a result claims 1, 8, 11, 12, 17, 26, 38, 44, 49, 72, 73, 77, and 78 are pending for examination with claims 1, 38, 49, 72, 73, 77, and 78 being independent claims. No new matter has been added.

### Allowable Subject Matter

Applicant notes with appreciation the indicated allowability of claims 11 and 26 at paragraph 6, page 7 of the Office Action. As Applicant believes that the independent claims from which these claims depend patentably distinguish over the cited art, Applicant has not re-written these claims in independent form at this time.

### Rejections Under 35 U.S.C. §103

The Office Action rejected claims 1, 7, 8, 12, 17, 38, 44, 49, 72-73, and 77-78 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,836,569 to Le Pennec et al. (hereinafter Le Pennec) in view of U.S. Patent No. 5,917,943 to Washizawa (hereinafter Washizawa).[1] Applicant respectfully traverses the rejection of claims 1, 8, 12, 17, 38, 44, 49, 72-73, and 77-78 herein.

#### 1. The Rejection of Claims 1, 8, 12, and 17

Claim 1 is directed to a method of processing n-dimensional digital signals, n being an integer at least equal to 1. The method comprises steps of (a) receiving an *n*-dimensional digital input signal; (b) computing an *n*-dimensional warped signal from said *n*-dimensional digital input signal, the *n*-dimensional warped signal including *n*-dimensional warped coefficients and *n*-dimensional signal warping grids; and (c) computing warped wavelet packet coefficients and

[1] Applicant notes that claim 7 was canceled in Applicant's prior response.

wavelet packet warping grids by applying an $n$-dimensional warped wavelet packet transform to said warped signal, with a binary tree where each node performs a one-dimensional warped subband processing along a respective dimension d, with $1 \leq d \leq n$.

In the rejection of claim 1, the Office Action asserts that Le Pennec discloses computing an $n$-dimensional warped signal from said $n$-dimensional digital input signal, the $n$-dimensional warped signal including $n$-dimensional warped coefficients and $n$-dimensional signal warping grids citing Fig. 1, element 110, and column 7, lines 18-24 and 60-65 of Le Pennec. Applicant respectfully disagrees. As described in Applicant's prior response, Le Pennec teaches processing n-dimensional digital signals using foveal filtering along certain trajectories; nowhere does Le Pennec disclose or suggest performing a signal warping operation as claimed.

With respect to column 7, lines 18-24 cited in the Office Action, this section of Le Pennec makes it clear that all calculations are based upon a regular sampling grid of the input signal (see col. 7, lines 22-25: the "trajectory finder (102) chooses trajectories over the n-dimensional support of the signal, along which signal information will be extracted, and outputs an n-directional trajectory list"), and not based upon n-dimensional signal warping grids, which are typically adapted to geometrical signal properties in different regions. As defined at column 4, lines 30-31 of Le Pennec, a trajectory is a "discretized surface of dimension n-1 over the signal support" (i.e., based upon a sampling grid of the input signal). Further, column 8, line 26 through column 9, line 36 and Fig. 2 of Le Pennec clearly describe that the trajectories are all based upon a regular sampling grid, and not upon warped grids (see col. 8, lines 27-30: "The input n-dimensional discrete signal (101) is specified by an array of samples s(m) where $m=(m_1, \ldots, m_n)$ is an n-dimensional index parameter and each $m_i$ is an integer for $1 \leq i \leq n$.") Thus, the trajectory list 103 output by the trajectory finder 102 of Le Pennec is based upon a regular sampling grid of the input signal, and not upon n dimensional signal warping grids as recited in claim 1.

The Office Actions' reliance on Fig. 1, element 110 (the geometric processor) and column 7, lines 60-65 of Le Pennec is similarly misplaced. As clearly described in Le Pennec at column 7, lines 60-65 the "geometric processor (110) decorrelates the coordinates of the points along the trajectories of the n-directional trajectory list (103) by applying invertible linear operators" and "outputs geometric coefficients (111)." As shown clearly in Fig. 1 of Le Pennec, the only output of the geometric processor 110 is the geometric coefficients 111 that specify

trajectories. These geometric coefficients 111, combined with the bandelet coefficients 109 that characterize the signal variations in the neighborhood of trajectories and the foveal residue 107 represent the input n-dimensional digitized signal 101. Accordingly, because the trajectories of the n-directional trajectory list are not warped, the geometric coefficients 111 that are based upon decorrelating the coordinate along those trajectories are not warped either.

However, the Office Action's rejection of claim 1 completely breaks down when the Office Action asserts that column 7, lines 28-38 (describing the foveal trajectory processor 104 and the foveal reconstruction processor 106) of Le Pennec discloses computing warped wavelet packet coefficients and wavelet packet warping grids by applying an *n*-dimensional warped wavelet packet transform to said warped signal. Column 7, lines 28-38 of Le Pennec is reproduced immediately below:

> "A foveal trajectory processor 104 computes foveal coefficients (105) which are one-dimensional inner products between the n-dimensional signal and translated one-dimensional foveal filters along each trajectory of the trajectory list. These foveal coefficients give information on the signal variations in the neighborhood of each trajectory. The foveal reconstruction processor (106) computes a foveal reconstruction signal from the input foveal coefficients (105) and the n-directional trajectory list (103)."

As can be seen quite clearly in Fig. 1, the inputs to the foveal trajectory processor 104 are the n-dimensional input signal 101 and the n-directional trajectory list. Similarly, the inputs to the foveal reconstruction processor 106 are the foveal coefficients 105 and the n-directional trajectory list. Neither the foveal trajectory processor 104 nor the foveal reconstruction processor 106 receives the output of the geometric processor 110 (the element asserted in the Office Action as providing the "n-dimensional warped signal") as an input. Accordingly, even if the geometric processor 110 of Le Pennec was performing any signal warping as asserted in the Office Action (which it does not), neither of the elements 104 and 106 asserted to compute the "warped wavelet packet coefficients and wavelet packet warping grids by applying an n-dimensional warped wavelet packet transform <u>to said warped signal</u>" could possibly do so because there is no connection in Le Pennec of the output of the geometric processor 110 to either of these elements. Washizawa fails to cure this deficiency. Accordingly, withdrawal of the

rejection of claim 1 under 35 U.S.C. §103(a) as being unpatentable over the asserted combination of Le Pennec and Washizawa is respectfully requested.

Claims 8, 11, 12, 17, and 26 depend either directly or indirectly from claim 1 and patentably distinguish over the asserted combination of Le Pennec and Washizawa for at least the same reasons. Moreover, each of these claims further patentably distinguish over the asserted combination of Le Pennec and Washizawa for additional reasons.

For example, with respect to claim 8, although the Office Action asserts that column 7, lines 60-65 and column 8, lines 26 - column 9, line 36 of Le Pennec teach this aspect, they very clearly do not. Nowhere do these sections of Le Pennec disclose or suggest a warping geometry, deformation parameters or any of the other aspects of Applicant's invention as recited in claim 8. Indeed, column 8, line 26 through column 9, line 36 prove quite the opposite, namely that the trajectories of Le Pennec are based upon a regular sampling grid of the input signal, and not upon signal warping grids that are computed from a warping geometry and deformation parameters.

Dependent claim 12 further recites applying a bandeletisation to said warped wavelet packet coefficients and wavelet packet warping grids. The Office Action asserts that column 7, lines 60-66 of Le Pennec discloses this feature, but it does not. According to the rejection of claim 1 in the Office Action, the geometric processor 110 computes the "n-dimensional warped signal" that includes n-dimensional warped coefficients and n-dimensional signal warping grids which are then used to compute the warped wavelet packet coefficients and wavelet packet warping grids to which bandeletisation is applied as recited in claim 12. However, as shown quite clearly in Fig. 1 of Le Pennec, the output of the geometric processor 110 has no input to the bandelet processor 108, and thus cannot possibly apply a bandeletisation to these elements as asserted. As shown in Fig. 1 of Le Pennec, the bandelet coefficients 109 are computed by the bandelet processor 108 based upon the foveal coefficients 105, and not based upon any output of the geometric processor 110. Moreover, Applicant's own application distinguishes this aspect of their invention from that described in Le Pennec noting: "As opposed to the method [of] E. Le Pennec and S. Mallat" (two of the same inventors of the present application), "bandelet coefficients are not computed from foveal coefficients but from warped wavelet packet coefficients." (See paragraph [0016] of Applicant's published application.)

Dependent claim 17 depends from claim 12 and patentably distinguishes over the asserted combination of Le Pennec and Washizawa for at least the same reasons. Moreover,

claim 17 further recites steps of quantizing said bandelet coefficients to produce quantized bandelet coefficients and encoding said bandelet coefficients. The asserted combination of Le Pennec and Washizawa cannot disclose or suggest Applicant's invention as further recited in claim 17 because the bandeletisation described in Le Pennec is not applied to warped wavelet packet coefficients, but rather to foveal coefficients.

2. The Rejection of Claims 38 and 44

Claim 38 is directed to a method of processing n-dimensional digital signals, where n is an integer at least equal to 1. The method comprises steps of (a) providing warped wavelet packet coefficients and wavelet packet warping grids; (b) computing a warped signal including $n$-dimensional warped coefficients and $n$-dimensional signal warping grids based on said warped wavelet packet coefficients and wavelet packet warping grids, with a binary tree where each node performs a one-dimensional inverse warped subband processing along a particular dimension d, with $1 \leq d \leq n$; and (c) applying an inverse warping operation to said warped signal to produce an output signal.

The Office Action points to column 7, lines 18-24 and column 8, lines 13-20 of Le Pennec as teaching the subject matter of claim 38. Given that the Office Action has acknowledged that Le Pennec "does not explicitly teach with a binary tree" as recited in step (c) of claim 1, Applicant assumes that the Office Action intended to include a reference to Washizawa. Applicant respectfully traverses this rejection.

First, as claim 38 recites "warped wavelet packet coefficients and wavelet packet warping grids," claim 38 patentably distinguishes over the asserted combination of Le Pennec and Washizawa for many of the reasons previously discussed with respect to claim 1 above. Second, claim 38 recites steps of computing a warped signal including $n$-dimensional warped coefficients and $n$-dimensional signal warping grids based on said warped wavelet packet coefficients and wavelet packet warping grids, with a binary tree where each node performs a one-dimensional ***inverse warped subband processing*** along a particular dimension d and applying ***an inverse warping operation*** to said warped signal to produce an output signal. Nowhere does Le Pennec or Washizawa disclose or teach performing inverse warped subband processing or applying an inverse warping operation as recited in claim 38, nor does the Office Action allege that they do. Accordingly, claim 38 patentably distinguishes over the asserted combination of Le Pennec and

Washizawa, and the rejection of claim 38 under 35 U.S.C. §103(a) thereover should be withdrawn.

Claim 44 depends from claim 38 and patentably distinguishes over the asserted combination of Le Pennec and Washizawa for at least the same reasons. Moreover, claim 44 further patentably distinguishes over the asserted combination of Le Pennec and Washizawa for reasons similar to those discussed with respect to claim 12 above.

3. The Rejection of Claim 49

Claim 49 is directed to a signal decompression method and includes steps (e) and (f) that are the same as steps (b) and (c) recited in claim 38. Accordingly, claim 49 patentably distinguishes over the asserted combination of Le Pennec and Washizawa for at least the same reasons discussed above with respect to claim 38. Specifically, nowhere does Le Pennec or Washizawa disclose or teach performing inverse warped subband processing or applying an inverse warping operation as recited in claim 49. Moreover, steps (a) through (d) of claim 49 recite limitations on how the wavelet packet warping grids are computed from a warping geometry and how warped wavelet packet coefficients are computed based on quantized bandelet coefficients and wavelet packet warping grids, none of which is disclosed or suggested by Le Pennec or Washizawa. Accordingly, claim 49 patentably distinguishes over the asserted combination of Le Pennec and Washizawa.

4. The Rejection of Claim 72

In rejecting claim 72, the Office Action relies on arguments similar to those made with respect to claim 17. Accordingly, Applicant reasserts the arguments set forth with respect to claim 17 above. Moreover, the Office Action fails to identify any structures in Le Pennec that disclose or suggest the "geometrical segmentation and sampling section," the "signal warping unit," or the "warped wavelet processor" recited in claim 72. Accordingly, claim 72 patentably distinguishes over the asserted combination of Le Pennec and Washizawa.

5. The Rejection of Claim 73

In rejecting claim 73, the Office Action relies on arguments similar to those made with respect to claims 17 and 44. Applicant respectfully points out that claim 73 is directed to a

digital signal decoder and includes limitation similar to those recited in independent claim 49, not limitations similar to those of claims 17 and 44. Accordingly, the arguments set forth in the rejection of claims 17 and 44 are not applicable to claim 73 as asserted. Claim 73 patentably distinguishes over the asserted combination of Le Pennec and Washizawa for reasons similar to those discussed above with respect to claim 49.

6. The Rejection of Claim 77

Claim 77 is directed to a computer program product having code instructions for performing steps similar to those of claim 17. Accordingly, claim 77 is allowable for at least the same reasons discussed above with respect to claim 17.

7. The Rejection of Claim 78

In rejecting claim 78, the Office Action relies on arguments similar to those made with respect to claims 17 and 44. Applicant respectfully points out that claim 78 is directed to a computer program product for decompressing n-dimensional signals having code instructions for performing steps similar to those recited in claim 49. Accordingly, the arguments set forth in the rejection of claims 17 and 44 are not applicable to claim 78 as asserted. Moreover, claim 78 patentably distinguishes over the asserted combination of Le Pennec and Washizawa for reasons similar to those discussed above with respect to claim 49.

8. Claim 80

Claim 80 is new and depends from claim 1. Accordingly, claim 80 patentably distinguishes over the asserted combination of Le Pennec and Washizawa for at least the same reasons discussed above with respect to claim 1.

Moreover, claim 80 further patentably distinguishes over the asserted combination of Le Pennec and Washizawa by reciting that the step of computing an *n*-dimensional warped signal includes computing an *n*-dimensional warped signal from said *n*-dimensional digital input signal, the *n*-dimensional warped signal including *n*-dimensional warped coefficients and *n*-dimensional signal warping grids from which the *n*-dimensional digital input signal can be reconstructed without any residual. As noted in Applicant's published application at paragraph [0016], this aspect of Applicant's invention is in contrast to Le Pennec in which the "signal is thus

equivalently represented by geometric coefficients (111) that specify the trajectories, bandelet coefficients (109) that characterize the signal variations in the neighborhood of trajectories, ***and the foveal residue (107)***. (See Le Pennec at column 7, line 64 through column 8, line 1, emphasis added.) Accordingly, claim 80 patentably distinguishes over the asserted combination of Le Penne and Washizawa and is in condition for allowance.

## CONCLUSION

In view of the foregoing amendments and remarks, reconsideration is respectfully requested. This application should now be in condition for allowance; a notice to this effect is respectfully requested. If the Examiner believes, after this amendment, that the application is not in condition for allowance, the Examiner is requested to call the Applicant's attorney at the telephone number listed below.

If this response is not considered timely filed and if a request for an extension of time is otherwise absent, Applicant hereby requests any necessary extension of time. If there is a fee occasioned by this response, including an extension fee, that is not covered by an enclosed check, or authorization to charge a deposit account submitted herewith, please charge any deficiency to Deposit Account No. 50/2762.

Respectfully submitted,
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